ONE OR MORE HEAT EXCHANGER COMPONENTS IN MAJOR PART OPERABLY LOCATABLE OUTSIDE COMPUTER CHASSIS

BACKGROUND

[01] A computer system comprises one or more heat producing components supported with a chassis. The heat producing components in one example comprise integrated circuits, computer drives, and processors. The computer system employs a heat sink, a fan, and/or a heat exchanger component to reduce one or more temperatures of the heat producing components.

[02] The heat sink in one example abuts the heat producing components. For example, the heat sink conducts heat from the heat producing components to reduce the temperatures of the heat producing components. The heat sink comprises a heat conducting metal or a heat conducting metal alloy. The heat sink in one example comprises one or more fins. The fins of the heat sink conduct heat from the heat producing components to reduce the temperatures of the heat producing components. In one example, a fan forces air against the fins of the heat sink to cause a dissipation of heat conducted from the heat producing components. In another example, the fan forces air against the heat producing components to reduce a temperature of the heat producing components.

[03] The heat exchanger component in one example reduces the temperatures of the heat producing components. The heat exchanger component comprises one or more portions of tubing and one or more fins. The heat exchanger component passes a fluid through the portions of tubing. The portions of tubing in one example abut the heat producing components. For example, the fluid transfers heat from the heat producing components. Upon a transfer of heat from the heat producing component, the heat exchanger component passes the fluid through the fins to transfer heat from the fluid to the fins. The fins in one

example dissipate the heat to reduce the temperatures of the heat producing components. A fan in one example forces air against the fins to aide in the dissipation of the heat.

SUMMARY

[04] The invention in one implementation encompasses an apparatus. The apparatus comprises one or more heat exchanger components that in major part are operably locatable outside a computer chassis and serve to reduce one or more temperatures of one or more heat producing components supported with the computer chassis.

[05] Another implementation of the invention encompasses an apparatus. The apparatus comprises means for passing a fluid against one or more heat producing components to promote a reduction of one or more temperatures of the one or more heat producing components. The apparatus comprises means for operably locating in major part outside of a computer chassis, the means for passing the fluid against one or more heat producing components.

[06] Yet another implementation of the invention encompasses a method. One or more heat exchanger components are employed to reduce one or more temperatures of one or more heat producing components. The one or more heat exchanger components are operably located in major part outside of a computer chassis.

DESCRIPTION OF THE DRAWING

[07] Features of exemplary implementations of the invention will become apparent from the description, the claims, and the accompanying drawing in which:

[08] FIG. 1 is a representation of an exemplary implementation of an apparatus that comprises one or more heat exchanger components, one or more heat producing components, one or more cold plates, one or more fans, and a chassis.

DETAILED DESCRIPTION

[09] Referring to the BACKGROUND section above, the heat exchanger is located within the chassis of the computer system. As one shortcoming, locating the heat exchanger component inside the chassis takes up space that could otherwise be available for additional computer components. As another shortcoming, the chassis limits a size of the heat sink, the heat exchanger, and/or the fan. For example, due to the limited space within the chassis, the heat exchanger may not be large enough to sufficiently cool the heat producing components. Since the heat exchanger is located within the chassis, the heat exchanger exhausts heat within the chassis during operation. As yet another shortcoming, the chassis requires additional cooling mechanisms (e.g., additional cooling fans) to remove the exhausted heat from the chassis. As still another shortcoming, the fan and/or the heat sink may cause an electrical shock and/or physical shock to one or more computer components of the computer system that may damage the computer system. The fan and/or the heat sink may also become unsecured from the chassis, thus causing damage to one or more computer components of the computer system.

[10] Turning to FIG. 1, an apparatus 100 in one example comprises a plurality of components such as hardware components. A number of such components can be combined or divided in one example of the apparatus 100. The apparatus 100 in one example comprises any (e.g., horizontal, oblique, or vertical) orientation, with the description and figures herein illustrating one exemplary orientation of the apparatus 100, for explanatory purposes.

[11] The apparatus 100 in one example comprises one or more heat exchanger components 102, one or more heat producing components 104, one or more cold plates 106, one or more fans 108 and 110, and a chassis 112. The heat exchanger component 102 in one example reduces one or more temperatures of the heat producing components 104.

[12] The heat exchanger component 102 in one example comprises a pump component 114, one or more portions of tubing 116, and one or more fins 118. The pump component 114 passes a fluid 117 through the portions of tubing 116. For example, the heat exchanger component 102 moves the fluid 117 through the portions of tubing 116 to reduce the temperatures of the heat producing components 104. The fluid 117 transfers heat to the fins 118 to reduce a temperature of the fluid 117 and the temperatures of the heat producing components 104.

[13] The heat producing component 104 in one example dissipates heat due to use in a computer system. The heat producing component 104 in one example comprises one or more of a processor and an integrated circuit mounted on a printed circuit board within the chassis 112. The heat producing component 104 transfers heat to the cold plate 106.

[14] The cold plate 106 in one example abuts one or more of the heat producing component 104 and the portions of tubing 116 to enable a transfer of heat from the heat producing component 104 to the fluid 117 inside the portions of tubing 116. The cold plate 106 in one example comprises one or more of a heat conducting metal and a heat conducting metal alloy. The heat exchanger component 102 passes the fluid 117 through the portions of tubing 116. The cold plate 106 in one example transfers heat through the portions of tubing 116 to the fluid 117 from the heat producing component 104 by convection and/or conduction. For example, the heat exchanger component 102 serves to reduce the temperatures of the heat producing component 104.

[15] Upon a transfer of the heat from the cold plate 106 to the fluid 117, the temperature of the fluid 117 increases and the temperature of the heat producing component 104 decreases. The fluid 117 in one example comprises a mixture of water and a coolant. The coolant in one example comprises ethylene glycol to prevent corrosion and/or low temperature freezing of the fluid 117.

[16] The heat exchanger component 102 employs the pump component 114 to move the fluid 117 through the portions of tubing 116. The pump component 114 pumps the fluid 117 to the cold plate 106 for the transfer of heat from the heat producing component 104 to the fluid 117. Upon the transfer of heat from the heat producing component 104, the pump component 114 moves the fluid 117 from the cold plate 106 to the fins 118. The fins 118 abut the portions of the tubing 116. For example, the portions of the tubing 116 travel through the fins 118. The fins comprise one or more of a heat conducting metal and heat conducting metal alloy. One or more of the portions of the tubing 116 and the fins 118 in one example comprise one or more heat transfer sections. The fluid 117 passes through the heat transfer sections of the portions of tubing 116 to transfer heat to the heat transfer sections of the fins 118 through convection and/or conduction. The fluid 117 in one example transfers the heat to the fins 118 to reduce a temperature of the fluid 117.

[17] Upon a decrease in the temperature of the fluid 117, the heat exchanger component 102 in one example passes the fluid 117 through the portions of tubing 116 to reduce a temperature of another one of the one or more heat producing components 104. For example, the pump component 114 circulates the fluid 117 through the portions of tubing 116 in a closed loop system.

[18] The heat exchanger component 102 in one example promotes a dissipation of heat through the fins 118. Upon the dissipation of heat through the fins 118, the fins 118 in one example absorb more heat from the fluid 117. In one example, the heat exchanger component 102 causes the dissipation of heat through an employment of natural convection. In another example, the heat exchanger component 102 employs one or more fans 108 and 110 to dissipate the heat. For example, the fans 108 and 110 force air against the fins 118 to cause the dissipation of heat. In one example, the fans 108 are located inside the chassis 112. In another example, the fans 110 are located outside the chassis 112. The fans 110 located

outside the chassis 112 may be larger than the fans 108 located inside the chassis 112. For example, the size of the fans 110 is not limited by the interior size of the chassis.

[19] The chassis 112 in one example comprises a computer chassis or server case. The chassis 112 has height 120 and width 122. The width 122 in one example is 43 cm (17 inches). The height 120 in one example may be measured in 1U units. For example, 1U equals 4.4 cm (1.75 inches). The fans 108 may have a width and/or a height as large as the width 122 and the height 120 of the chassis 112. One or more of the computer or server cases in one example fit into a rack. For example, the rack has the width 122 of 43 cm and a height 120 of 42U. The fans 110 may have a width and/or a height as large as the width and the height of the rack. Where the fans 110 have the width and/or the height as large as the width and the height of the rack, the fans 110 are able to force more air against the heat exchanger component 102 than for a smaller fan. For example, the fans 110 dissipate a greater amount of heat from the fins 118 than for the smaller fan.

[20] The heat exchanger component 102 in major part is operably locatable outside of the chassis 112 to promote an increase in one or more of efficiency, serviceability, and flexibility of the heat exchanger component 102. The fins 118 in one example comprise the major part of the heat exchanger component 102. For example, the fins 118 are located outside the chassis during operation of the heat exchanger component 102. In one example, locating the heat exchanger component 102 in major part outside of the chassis 112 increases space inside of the chassis 112. For example, locating the heat exchanger component 102 outside of the computer chassis 112 allows for extra space inside of the computer chassis 112 than if the heat exchanger component 102 were located inside the chassis 102. Locating the heat exchanger component 102 outside of the computer chassis 112 makes available the extra space for placement of one or more additional computer components. The computer

components in one example comprise one or more of a circuit board, a processor, and the fan 108.

[21] In another example, locating the heat exchanger component 102 outside of the chassis 112 reduces heat transfer to objects from the heat exchanger component 102 to components within the chassis. For example, if the heat exchanger component 102 is located within the chassis 112, the heat exchanger component 102 transfers heat to the heat producing components 104. Locating the heat exchanger component 102 outside of the chassis 112 promotes an increase in an efficiency of a temperature reduction of the heat producing components 104. For example, where the location of the heat exchanger component 102 is outside of the chassis 112, one or more temperatures of the heat producing components 104 are lower than if the heat exchanger component 102 is located inside the chassis 112. The location of the heat exchanger component 102 outside of the chassis 112 promotes the increase in the efficiency of temperature reduction of the heat producing components 104 because the temperatures of the heat producing components 104 are lower than if the heat exchanger component 102 was located within the chassis 112.

[22] In yet another example, locating the heat exchanger component 102 outside of the chassis 112 allows for the fans 110 to be larger than the fans 108. The fans 110 in one example are larger than the fans 108 because there is more open space outside of the chassis 112 than inside of the chassis 112. For example, the fans 110 can have a width and a height as large as the width 122 and the height 120 of the chassis 112. Where one or more chasses 112 fit into a rack, additional fans can be as large as the rack. The heat exchanger component 102 located outside of the chasses 112 may employ one or more of the fans 108, 110, and the additional fans to reduce one or more temperatures of the fins 118. Locating the heat exchanger component 102 outside of the chassis 112 in one example allows a natural convection to force air against the fins 118 to promote heat dissipation at the fins 118.

[23] In still another example, a location of the heat exchanger component 102 outside of the chassis 112 promotes an ease in one or more of a accessibility and serviceability of the chassis 112. The location in one example promotes an ease in the accessibility of the chassis 112 to promote the ease of the serviceability of the chassis 112. For example, the location allows a user the ability to move the chassis 112 in and out of the rack without uncoupling the heat exchanger component 102 from the chassis 112. The location promotes an increase in the serviceability through an ability to fix or replace one or more of the fan 110 and the heat exchanger component 102.

[24] The steps or operations described herein are just exemplary. There may be many variations to these steps or operations without departing from the spirit of the invention. For instance, the steps may be performed in a differing order, or steps may be added, deleted, or modified.

[25] Although exemplary implementations of the invention have been depicted and described in detail herein, it will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be made without departing from the spirit of the invention and these are therefore considered to be within the scope of the invention as defined in the following claims.